ASTRONOMICAL SOCIETY OF LONDON.

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The President read an extract from a letter of Professor Encke, dated Berlin, Dec. 7, 1828, in which he states the following places of his comet, as the results of his own observations: —

Date.	M. T. Paris.	A. R.	Declin.	Calcul.—Observ. A.R.	Calcul.—Observ. Dec.	
1828.	h m s	° ′ ″	° ′ ″	′ ″	′ ″	
Oct. 13	8 52 0	7 17 45	+28 44 57	−2 3	+ 16	Dorpat.
27	6 34 28	351 57 40	26 41 4	2 4	− 31	Berlin.
Nov. 4	7 29 45	342 10 52	23 50 25	2 27	1 16	—
5	8 26 42	340 55 31	23 22 50	2 12	20	—
10	6 34 51	335 8 39	21 25 50	2 17	21	—
13	10 39 32	331 34 55	19 25 0	2 17	19	—
25	6 1 17	319 29 48	12 50 23	3 0	51	—
26	6 4 33	318 32 13	12 15 57	3 11	1 23	—
Dec. 2	6 4 13	312 49 58	8 40 38	3 35	1 1	—
5	5 53 15	309 56 34	+ 6 49 15	−3 36	−1 42	—

"These errors," he observes, "follow a law different from the changes which would have taken place if the passage through the perihelion had been ill determined. I do not, therefore, think that this element is liable to any great correction. I have computed an ephemeris by M. Damoiseau's elements, which vary from mine only in the perihelion passage, and I find the following differences: —

	A. R.	Dec.
	° ′ ″	′ ″
1828.—Oct. 10.	−0 10 12	− 5 52
18.	7 29	7 39
26.	− 2 10	8 45
Nov. 3.	+ 5 31	8 23
11.	14 31	6 5
19.	23 50	2 13
27.	33 34	− 2 37
Dec. 5.	44 16	+ 8 53
13.	0 56 26	16 14
21.	1 7 55	23 34
29.	+1 8 18	+25 32

"According to these elements, the errors would have undergone a variation of nearly 50′ in right ascension between the 13th October and the 5th December."

A paper was next read "On the determination of the distance of a Comet from the Earth," by J. W. Lubbock, Esq. M.A.S. The author in this paper proposes to examine the principle of the various methods which have been proposed for the resolution of this problem,—to bring them under one notation,—and to ascertain from which the greatest advantage is to be expected.

In problems of physical astronomy, where an approximate solution is to be obtained from observations embracing an interval of time, short in comparison of the whole period of the phases of the phenomena, we may express the successive differential coefficients of any function in terms of the finite differences of the function itself, by formulæ well known to geometers. In that under consideration, the distance of the comet from the earth is the unknown quantity; and by means of a well-known theorem, that distance at the first and third observations may be expressed in terms of the distance at the second and known quantities. By substitution, then, in the differential equations of the comet's motion, or in any of their integrals, we may obtain equations in which the comet's distance from the earth is the only unknown quantity, and which furnish so many different methods of determining that distance.

The author exemplifies this by instances drawn from the *Mécha-nique Céleste*, and the work of M. Legendre, "On the Determination of Comets' Orbits;" where the equation denoting that the velocity of the comet at the second observation is equal to that of a body describing the chord uniformly in a time equal to that of describing the arc between the extreme observations, is derived from the general expression of the velocity in terms of the radius vector. This is the principle on which Newton's method in the *Principia* is founded. He then shews how the equation given by Lagrange in the *Méchanique Analytique*, vol. ii. p. 57, is derivable from the same system of substitution; but he remarks, that Lagrange has there stated this equation incorrectly, and gives what he considers the correct statement; and he applies the same principle to deduce the equation employed by Mr. Ivory in his paper on this subject.

The author then states, that by a peculiar combination of the fundamental equations and their derivatives, not before noticed, he has succeeded in reducing the final equation for determining the comet's curtate distance, from the seventh degree to a quadratic, — a reduction which had been supposed impracticable.

Having reduced all the equations employed in the various methods to one notation, he includes them in a printed form adapted to their reduction to numbers by logarithmic computation, and exemplifies its use in the determination of the elements of the celebrated comet of Halley, from three observations of Messier. The ellipse deduced by his method, as a first approximation, is, he remarks, equally correct with that of Klinkenberg, which Olbers and Delambre have adopted.

He concludes with some remarks on the correction of approximate elements; and he accompanies his paper with a copy of the printed skeleton form employed, and with the whole of the numerical computations in a separate volume.

There was also read a paper on the longitudes of Calcutta, Madras, and Futty Ghur, as determined by lunar transits and eclipses of Jupiter's first satellite, by Major J. A. Hodgson, Sur-

veyor-General of India, accompanied with the original observations and reductions.

The longitude of the place of observation is computed from the R.A. of the moon and principal fixed stars, as given in the Nautical Almanack, the absolute time and corrections for the errors of the transit instrument being obtained from Greenwich stars advantageously situated for the purpose.

Longitude of Calcutta.

	h	m	s	
By 93 culminations of the moon's preceding limb	5	53	34,892	E
By 90 culminations of the moon's succeeding limb			17,563	
Mean	5	53	26,227	
Reduction to the flag-staff of Fort William.....			— 5,069	
East longitude of the flag-staff of Fort William	5	53	21,158	
Or, 88° 20′ 17″,37				

These observations will be continued; and it is probable that when a more powerful instrument, now expected from England, is used, the results from opposite limbs of the moon will be closer.

Longitude of the Madras Observatory.

	m	s	
By 8 corresponding immersions of Jupiter's first satellite, Madras Observatory	31	59,66	West of flag-staff, Fort William.
By 9 corresponding emersions of Jupiter's first satellite, Madras Observatory	32	25,88	
Mean.....	32	12,52	
East longitude of Fort William flag-staff ...	5 53	21,16	
East longitude of Madras Observatory	5 21	8,64	

Mr. Goldingham (Ast. Soc. Mem. vol. iii. p. 268) gives for the longitude of Madras, $5^h\ 21^m\ 9^s,4$.

All these observations were made at Calcutta by Major Hodgson, and at the Madras Observatory by the same observer; the focal length, aperture, and power of the telescopes being the same.

Longitude of Futty Ghur, a military station on the Ganges. (27° 21′ 35″ N. lat.)

[Telescopes and observers as above.]

	m	s	
By 5 corresponding immersions of Jupiter's first satellite, Futty Ghur	2	52,98	West of Madras Observatory.
By 5 corresponding emersions of Jupiter's first satellite, Futty Ghur	2	12,24	
Mean	2	32,61	
East longitude of Madras Observatory	5 21	9,37	by Mr. Goldingham.
East longitude of Futty Ghur.....	5 18	36,76	
Or using Major Hodgson's long. of Madras,	5 18	36,04	
The mean of ten observations computed from the N. A. give	5 18	35,6	
A few lunar transits	5 18	37,1	

" The use of the transit telescope is becoming more general in Hindoostan, and by it differences of meridians will be better deter-

mined than by any other astronomical means. Over the greater part of those level and valuable countries which extend from the Indus to the eastern extremities of the valley of Assam, it is impossible to carry a series of great triangles. The differences of meridians of *distant* places must therefore depend upon careful astronomical observation of lunar transits and eclipses of Jupiter's satellites, or the transference of time by chronometers."

"Naval and military officers, who have more opportunities of multiplying useful observations than any other class of men, seldom fail, where they have it in their power, to turn to good account the instructions of astronomers, when they are stated in plain language, and illustrated by examples precisely and clearly arranged."

The last paper read was from Mr. Rumker, the astronomer at the Paramatta Observatory, detailing the observations for determining the December solstice in 1827, with one of Reichenbach's repeating circles; and likewise the observations of certain circumpolar stars, about the same period of time, by means of the mural circle. In reducing the observations for the solstice, Mr. Rumker (on account of the small zenith distance of the sun) applies a correction different from that given by M. Biot in his *Astronomie*. The result of his observations makes the mean obliquity of the ecliptic, reduced to January 1, 1828, equal to 23° 27′ 40″,01.

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